



# Product Catalogue

## Solar thermal series





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Solar system for district heating network, Hamburg Wilhelmsburg, Germany, 1348m<sup>2</sup> ----- By Ritter XL Solar



# Foreword



## We never stop working on our mission to create a sustainable future

Environmental protection and the sustainable use of natural resources are both our goal and motivation. The increasing energy consumption worldwide by means of fossil fuels implies strong economic and environmental costs. As heating accounts for 56% of the world's total final energy consumption, it becomes extremely important to switch to renewable energy. Compared to other renewable energy sources, solar thermal contributes considerably to the energy supply.

Being as a subsidiary of Linuo Paradigma, one of the most important renewable energy companies in China and a successful Sino-German joint venture, Linuo Ritter International relies on the technologies and know-how of its' strong partners from the largest solar thermal markets: China and Europe, and give its best to supply high-quality solar energy products with advanced technologies to customers all over the world.

## Experienced and reliable - our esteemed partners



Among the top brands in China!

Linuo Paradigma is the first Sino-German joint venture that develops, manufactures and distributes market oriented solar solutions in China. And its business scope has now expanded to solar thermal, solar photovoltaic and heat pumps.

- It has fully automated production facilities and 80,000 m<sup>2</sup> production area to provide a sufficient production capacity of 5 million sets of solar water heater and 1.5 million square meters of solar collector per year.
- Linuo Paradigma already installed 50 millions of square meters of evacuated tube collectors domestically and oversea.

80,000 m<sup>2</sup> production area

50 million m<sup>2</sup>  
installation of solar thermal project

ENISO European standard testing center







## LINUO 力諾 | Chinese leading enterprise on solar and health industries

With more than 20 years focus on solar and pharmaceutical industries after established in 1994, Linuo Group has become one of the global leaders in solar thermal technology, best special glass manufacturers and expert in solar power generation. The 8 sub-groups cover solar thermal, solar power generation, special coating and pharmacy industries.

**8,000** employees domestic and overseas

**Top 500** enterprises fo China

**1.5 billion** U.S.dollar annual revenue



## | German market leader of vacuum tube solar technologies

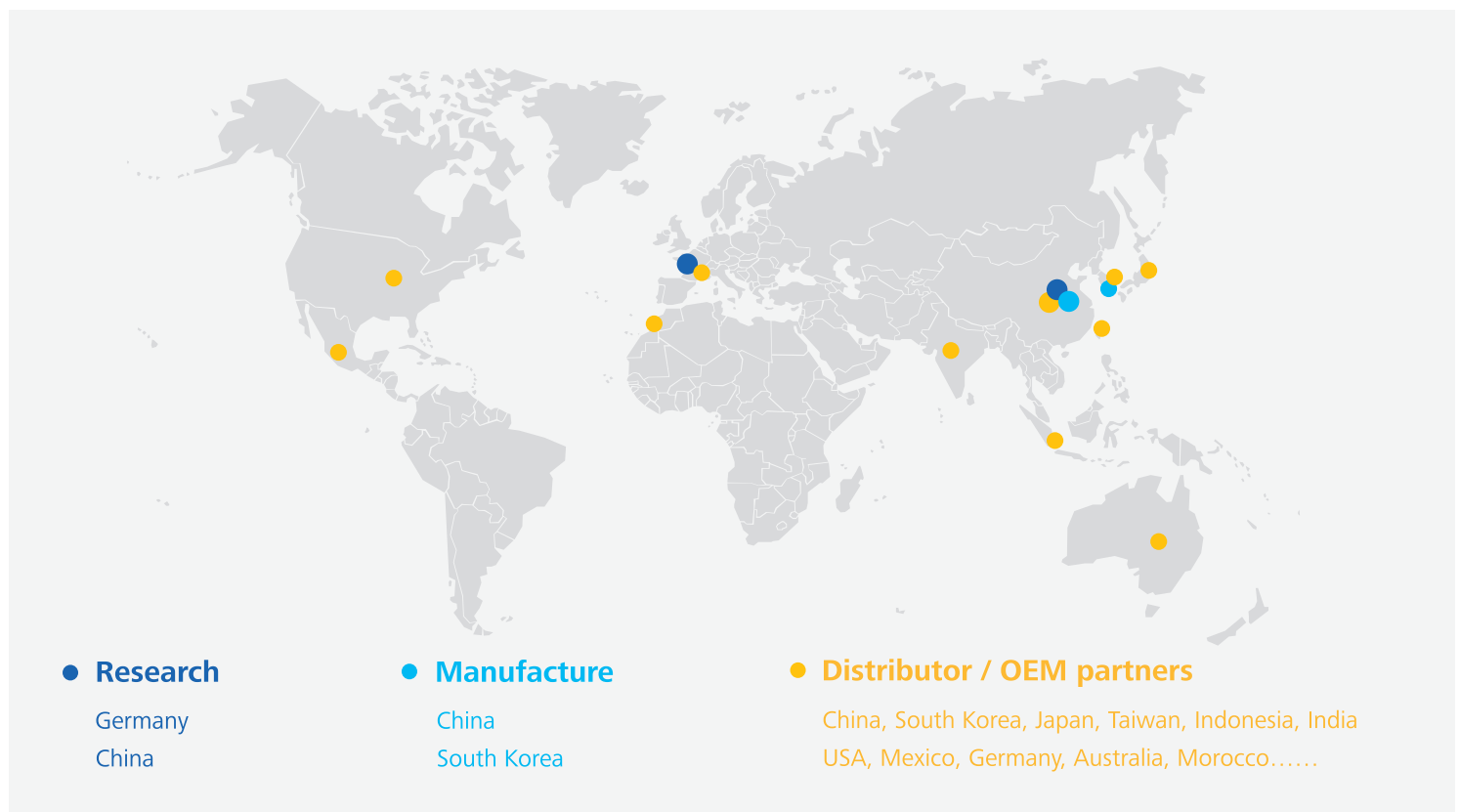
Established in 1988 (Ritter Energie- und Umwelttechnik GmbH & Co. KG.), Ritter Gruppe is the German market leader that offers highly efficient and innovative solutions for ecological heating, water heating and process heat with its world-leading evacuated tube collector technology and rich experience on solar thermal project design.



**0.0t** of carbon dioxide: to become the firts CO<sub>2</sub>-neutral heating company in the world

**90%** of heating costs can be saved by installing its' solar thermal system

## Expansive and sustainable – Our worldwide solar network!



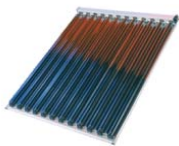


# Content

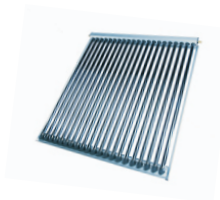


## Solar collector

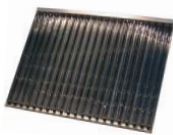
OEM evacuated solar collectors: pressurized and non-pressurized



**Evacuated tube collectors with CPC-reflector ----- 2**  
CPC 1506, CPC 1509, CPC 1512, CPC 1515, CPC 1518



**Evacuated tube collectors without CPC-reflector ----- 6**  
U1521



**CPC XL Evacuated tube collectors with CPC-reflector ----- 8**  
CPC OEM XL 1514, CPC OEM XL 1521,  
CPC OEM XL 1914, CPC OEM XL 1918, CPC OEM XL 1921



**Evacuated heat pipe collectors ----- 11**  
R58-1812, R58-1818, R58-1824, R58-1830



**LPC Evacuated tube collectors ----- 14**  
LPC 47-1550, LPC 58-1830, LPC 58-1850

## Solar water heater

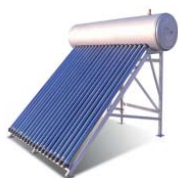
### Non-pressurized solar water heater



**Non-pressurized thermosiphon systems with evacuated tubes ----- 16**

LP-100L, LP-200L, LP-300L

### Pressurized solar water heater



**Pressurized thermosiphon systems with evacuated heat pipes ----- 18**

HP-100L, HP-150L, HP-200L, HP-300L



**Split pressurized thermosiphon systems with evacuated heat pipes ----- 19**

PS-150L, PS-200L, PS-300L



**Pressurized jacket-type thermosiphon systems with evacuated tubes ----- 20**

JT-150L, JT-200L, JT-250L

### Accessories of thermosiphon system

**Electric heater, Auto water valve, System controller, Assistant tank ----- 21**

## Reference projects

**Reference projects for solar collectors and solar water heaters ----- 22**



# 1 Forced circulation system

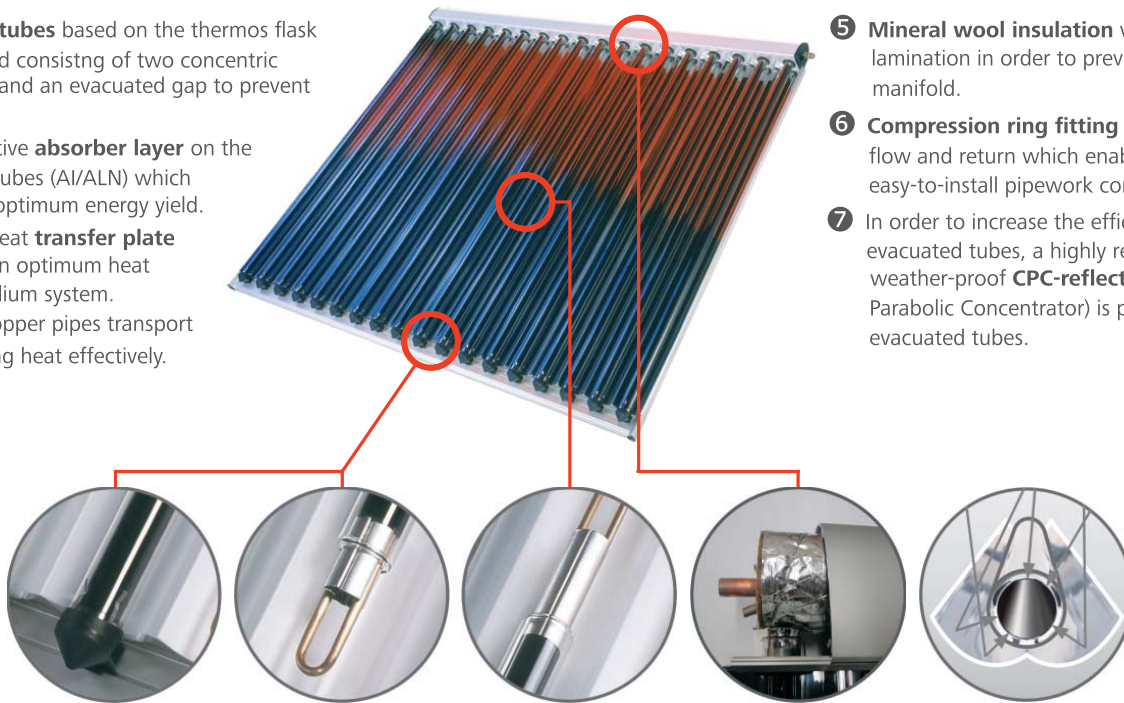
Evacuated tube collectors with CPC-reflector .....	2
Evacuated tube collectors without CPC-reflector .....	6
CPC OEM XL Evacuated tube collectors with CPC-reflector .....	8
Evacuated heat pipe collectors .....	11
LPC Evacuated tube collectors .....	14



## Evacuated tube collector technology

### Evacuated tube collector technology with CPC-reflector by Ritter Solar

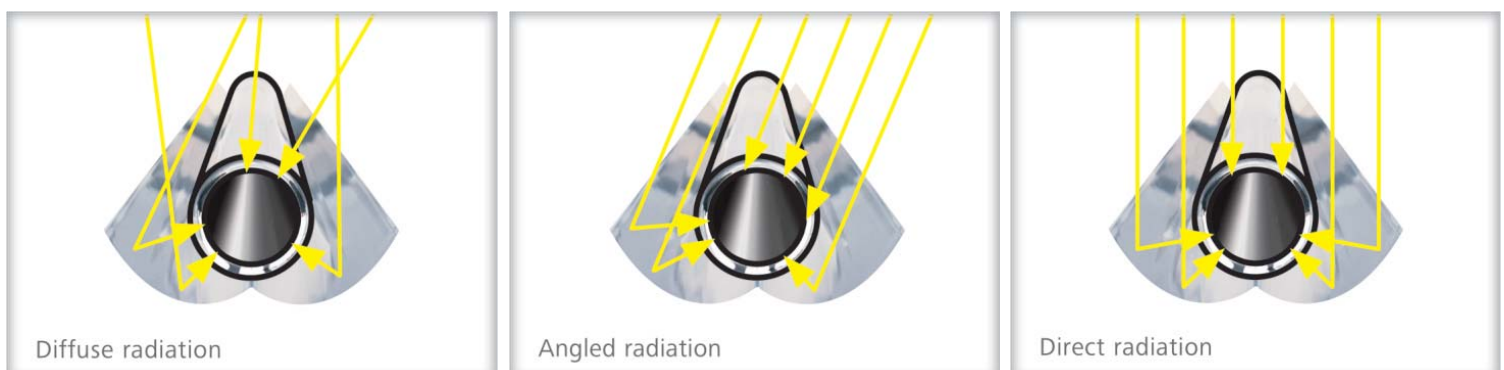
- ❶ **Evacuated tubes** based on the thermos flask principle and consisting of two concentric glass tubes and an evacuated gap to prevent heat loss.
- ❷ Highly selective **absorber layer** on the inner glass tubes (Al/ALN) which enables an optimum energy yield.
- ❸ Aluminum heat **transfer plate** to provide an optimum heat transfer medium system.
- ❹ U-shaped copper pipes transport the extracting heat effectively.
- ❺ **Mineral wool insulation** with an aluminium lamination in order to prevent heat loss in the manifold.
- ❻ **Compression ring fitting** (Ø 15 mm) for flow and return which enable a safe and easy-to-install pipework connections.
- ❼ In order to increase the efficiency of the evacuated tubes, a highly reflecting, weather-proof **CPC-reflector** (Compound Parabolic Concentrator) is placed behind the evacuated tubes.



### CPC-reflector made in Germany

In order to increase the efficiency of the evacuated tubes, a highly reflecting and weather-proof CPC-reflector (**C**ompound **P**arabolic **C**oncentrator) is placed behind the evacuated tubes. The special mirror geometry ensures that even at unfavorable irradiation angles direct and diffuse sunlight falls onto the absorber. This substantially improves the energy yield of a solar collector. Unfavorable irradiation angles are given at diagonally incoming light (azimuth angle) (no south adjustment of the mounting area, sun progress from east to west, diffuse irradiation).

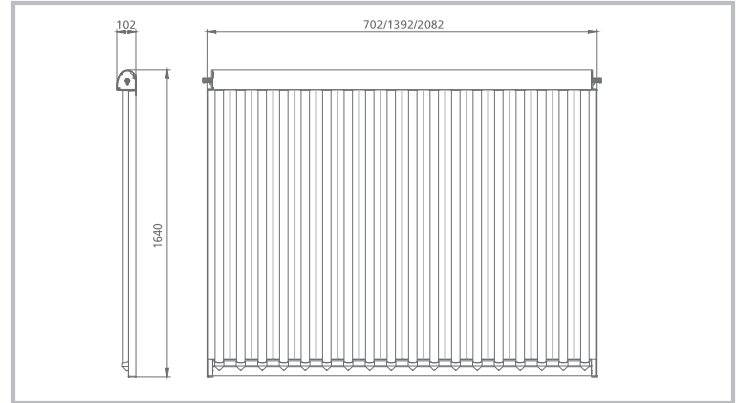
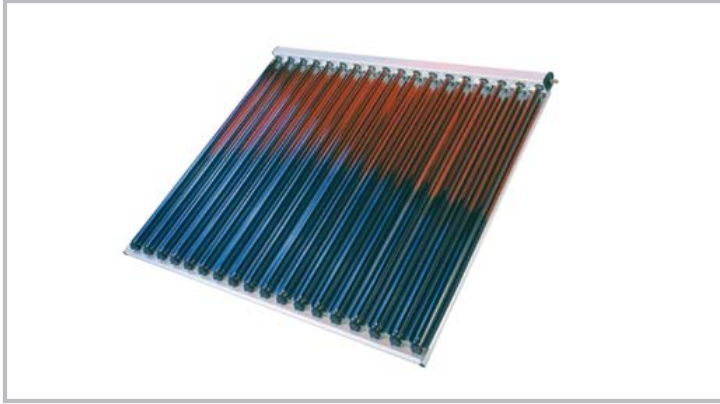
The mirror is produced from a metal sheet with protective coating using accurate roll forming technology. Due to the special fastening technique the mirror can be exchanged without using tools.



## Evacuated tube collectors with CPC-reflector

for water, space and process heating and solar cooling.

\* Recommend for commercial and industrial applications with 90 ~ 130°C temperature requirement.



### Scope of delivery

Fully pre-assembled unit comprising

- 6, 9, 12, 15 or 18 evacuated tubes based on the thermos flask principle,
- manifold with direct flow heat conduction unit and dry tube connection,
- CPC-reflector.

Collectors are packed in individual boxes. In addition, there is a sun protection sheet over the evacuated tubes.

### Installation types

- Pitched roof, flat roof, on-wall.

### Advantages and benefits

- Short installation times due to complete pre-assembled collectors.
- Simple and reliable connection technology in order to extend several collectors side by side through pre-assembled screw connections. Further tubing and extra thermal insulation is not necessary.
- Integrated return pipe and highly efficient thermal insulation.
- Manageable module sizes for a very high performance and a quick and easy installation.
- Flow and return pipes may be filled on the left or the right side of the manifold.
- High flexibility due to the different widths and lengths of the collectors.
- Quick and easy exchange of the evacuated tubes without using any tool.

### Performance characteristics

- Low pressure loss allows several modules to be connected in series.
- Minimum of soldering points ensures a high leakage safety.
- Well-known indestructibility of Ritter Solar tubes confirmed by the hailstone test DIN EN 12975-2.
- High energy yield in the transitional period and winter.
- In wintery conditions with a 400 W/m<sup>2</sup> irradiation and 0 °C air temperature at a temperature of 20 °C, Ritter Solar evacuated tube collectors already have a higher energy yield than flat collectors.
- Extremely low heat loss due to the high vacuum.
- Outstanding design.

## Evacuated tube collectors with CPC-reflector

### Specification

Series		CPC 1506	CPC 1509	CPC 1512
Number of evacuated tubes		6	9	12
$\eta_0$ in relation to aperture, EN 12975	%	64.2	64.2	64.2
$a_1$ with wind, in relation to aperture	W/(m²k)	0.89	0.89	0.89
$a_2$ with wind, in relation to aperture	W/(m²k²)	0.001	0.001	0.001
Yield forecast (location Würzburg, Germany, reference area 3 m²)	kWh/m²a	651	651	651
Yield forecast (location Würzburg, Germany, reference area 5 m²)	kWh/m²a	589	589	589
Grid dimensions (length x height x depth)	m	0.70 x 1.64 x 0.10	1.05 x 1.64 x 0.10	1.39 x 1.64 x 0.10
Gross surface area	m²	1.15	1.72	2.28
Aperture area	m²	1.0	1.5	2.0
Collector contents	l	0.8	1.2	1.6
Weight	kg	19	28	37
Max. working overpressure	bar	10	10	10
Max. stagnation temperature. <sup>1)</sup>	°C	272	272	272
Connection diameter, compression fitting	mm	15	15	15
Sensor sleeve	mm	6	6	6
Collector material	Al / Cu / glass / silicone / PBT / EPDM / TPE			
Glass tube material	borosilicate glass 3.3			
Selective absorber coating material	Cu / SS-AlN /AlN			
Glass tube (Ø ext./Ø int./wall thickn./tube lgth.)	mm	47/37/1.6/1500		
Colour (aluminium frame profile, anodised)	aluminum grey			
Colour (plastic parts)	black			
Thermal shock test / ITW test number	06COL513/1			
Hailstone test according to DIN EN 12975-2 / TÜV test number	435/142448			
EC type examination	Z-IS-DDK-MUC-07-08-100029919-003			
DIN CERTCO registration number	011-7S1948 R			

<sup>1)</sup> at 1000 W/m<sup>2</sup> and 30 °C.

### International certifications & standards:





## Evacuated tube collectors with CPC-reflector

### Specification

Series		CPC 1515	CPC 1518
Number of evacuated tubes		15	18
$\eta_0$ in relation to aperture, EN 12975	%	64.2	64.2
$a_1$ with wind, in relation to aperture	W/(m²k)	0.89	0.89
$a_2$ with wind, in relation to aperture	W/(m²k²)	0.001	0.001
Yield forecast (location Würzburg, Germany, reference area 3 m²)	kWh/m²a	651	651
Yield forecast (location Würzburg, Germany, reference area 5 m²)	kWh/m²a	589	589
Grid dimensions (length x height x depth)	m	1.74 x 1.64 x 0.10	2.08 x 1.64 x 0.10
Gross surface area	m²	2.85	3.41
Aperture area	m²	2.5	3.0
Collector contents	l	2	2.4
Weight	kg	46	54
Max. working overpressure	bar	10	10
Max. stagnation temperature. <sup>1)</sup>	°C	272	272
Connection diameter, compression fitting	mm	15	15
Sensor sleeve	mm	6	6
Collector material		Al / Cu / glass / silicone / PBT / EPDM / TPE	
Glass tube material		borosilicate glass 3.3	
Selective absorber coating material		Cu / SS-AIN /AIN	
Glass tube (Ø ext./Ø int./wall thckn./tube lgth.)	mm	47/37/1.6/1500	
Colour (aluminium frame profile, anodised)		aluminum grey	
Colour (plastic parts)		black	
Thermal shock test / ITW test number		06COL513/1	
Hailstone test according to DIN EN 12975-2 / TÜV test number		435/142448	
EC type examination		Z-IS-DDK-MUC-07-08-100029919-003	
DIN CERTCO registration number		011-751948 R	

<sup>1)</sup> at 1000 W/m<sup>2</sup> and 30 °C.

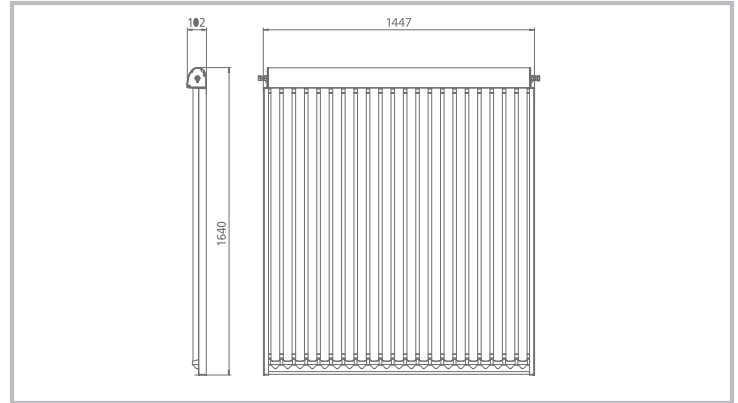
### International certifications & standards:



## Evacuated tube collector without CPC-reflector

for water, space and process heating and solar cooling.

\* Recommend for commercial and industrial applications with 90 ~ 130°C temperature requirement.



### Scope of delivery

Fully pre-assembled unit comprising

- 21 evacuated tubes based on the thermos flask principle,
- manifold with direct flow heat conduction unit and dry tube connection.

Collectors are packed in individual boxes. In addition, there is a sun protection sheet over the evacuated tubes.

### Installation types

- Pitched roof, flat roof, horizontally.

### Advantages and benefits

- Specially developed for applications that require horizontally mounting.
- Short installation times due to complete pre-assembled collectors.
- Simple and reliable connection technology in order to extend several collectors side by side through pre-assembled screw connections. Further tubing and extra thermal insulation is not necessary.
- Integrated return pipe and highly efficient thermal insulation.
- Manageable module sizes for a very high performance and a quick and easy installation.
- Flow and return pipes may be filled on the left or the right side of the manifold.
- High flexibility due to the different widths and lengths of the collectors.
- Quick and easy exchange of the evacuated tubes without using any tool.

### Performance characteristics

- Low pressure loss allows several modules to be connected in series.
- Minimum of soldering points ensures a high leakage safety.
- Well-known indestructibility of Ritter Solar tubes confirmed by the hailstone test DIN EN 12975-2.
- High energy yield in the transitional period and winter.
- In wintery conditions with a 400 W/m<sup>2</sup> irradiation and 0 °C air temperature at a temperature of 20 °C, Ritter Solar evacuated tube collectors already have a higher energy yield than flat collectors.
- Extremely low heat loss due to the high vacuum.
- Outstanding design.

## Evacuated tube collector without CPC-reflector

### Specification

Series		U 1521
Number of evacuated tubes		21
$\eta$ in relation to aperture, EN 12975	%	74.5
$c_1$ with wind, in relation to aperture	W/(m <sup>2</sup> k)	2.007
$c_2$ with wind, in relation to aperture	W/(m <sup>2</sup> k <sup>2</sup> )	0.005
Yield forecast (location Würzburg, Germany, reference area 3 m <sup>2</sup> )	kWh/(m <sup>2</sup> a)	780
Yield forecast (location Würzburg, Germany, reference area 5 m <sup>2</sup> )	kWh/(m <sup>2</sup> a)	619
Grid dimensions (length x height x depth)	m	1.45 x 1.64 x 0.10
Gross surface area	m <sup>2</sup>	2.37
Aperture area	m <sup>2</sup>	1.98
Collector contents	l	2.5
Weight	kg	51
Max. working overpressure	bar	10
Max. stagnation temperature. <sup>1)</sup>	°C	220
Connection diameter, compression fitting	mm	15
Sensor sleeve and sensor PT 1000	mm	6
Collector material	Al / Cu / glass / silicone / PBT / EPDM / TPE	
Glass tube material	borosilicate glass 3.3	
Selective absorber coating material	Cu / SS-AlN / AlN	
Glass tube (Ø ext./Ø int./wall thickn./tube lgth.)	mm	47/37/1.6/1500
Colour (aluminium frame profile, anodised)	aluminium grey	
Colour (plastic parts)	black	
Thermal shock test / ITW test number	06COL517	
Hailstone test according to DIN EN 12975-2 / TÜV test number	435/142448	
EC type examination	Z-IS-DDK-MUC-07-08-100029919-003	
DIN CERTCO registration number	011-7S1990 R	

<sup>1)</sup> at 1000 W/m<sup>2</sup> and 30 °C.

### International certifications & standards:

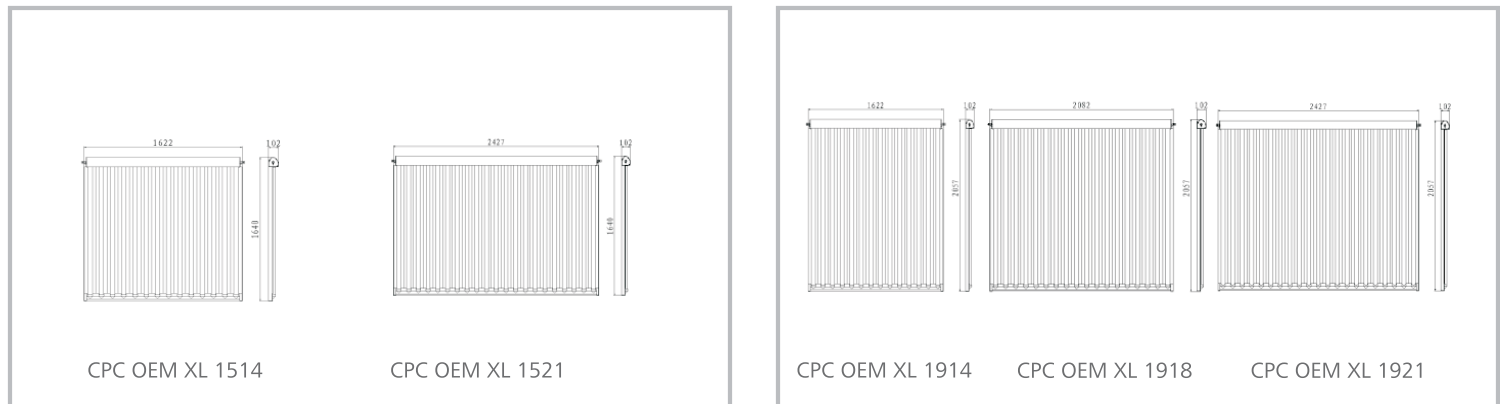




## CPC OEM XL Evacuated tube collectors with CPC-reflector

for water, space and process heating and solar cooling.

\* Recommend for commercial and industrial applications with 90 ~ 130°C temperature requirement.



Available in two different tube lengths: 1.50 m and 1.92 m

### Scope of delivery

Fully pre-assembled unit comprising

- 14, 18 or 21 evacuated tubes based on the thermos flask principle,
- manifold with direct flow heat conduction unit and dry tube connection,

Collectors are packed in individual boxes. In addition, there is a sun protection sheet over the evacuated tubes.

### Installation types

- Pitched roof, flat roof, on-wall.

### Advantages and benefits

- Short installation times due to complete pre-assembled collectors.
- Simple and reliable connection technology in order to extend several collectors side by side through pre-assembled screw connections. Further tubing and extra thermal insulation is not necessary.
- Integrated return pipe and highly efficient thermal insulation.
- Manageable module sizes for a very high performance and a quick and easy installation.
- Flow and return pipes may be filled on the left or the right side of the manifold.
- High flexibility due to the two different lengths of the collectors.
- Quick and easy exchange of the evacuated tubes without using any tool.

### Performance characteristics

- Low pressure loss allows several modules to be connected in series.
- Minimum of soldering points ensures a high leakage safety.
- Well-known indestructibility of Ritter Solar tubes confirmed by the hailstone test DIN EN 12975-2.
- High energy yield in the transitional period and winter.
- In wintery conditions with a 400 W/m<sup>2</sup> irradiation and 0 °C air temperature at a temperature of 20 °C, Ritter Solar evacuated tube collectors already have a higher energy yield than flat collectors.
- Extremely low heat loss due to the high vacuum.
- Outstanding design.

## CPC OEM XL Evacuated tube collectors with CPC-reflector

### Specification

Series		CPC OEM XL 1514	CPC OEM XL 1521
Number of evacuated tubes		14	21
$\eta_0$ in relation to aperture, EN 12975	%	64.2	64.2
$a_1$ with wind, in relation to aperture	W/(m <sup>2</sup> k)	0.89	0.89
$a_2$ with wind, in relation to aperture	W/(m <sup>2</sup> k <sup>2</sup> )	0.001	0.001
Yield forecast (location Würzburg, Germany, reference area 3 m <sup>2</sup> )	kWh/m <sup>2</sup> a	651	651
Yield forecast (location Würzburg, Germany, reference area 5 m <sup>2</sup> )	kWh/m <sup>2</sup> a	589	589
Grid dimensions (length x height x depth)	m	1.62 x 1.64 x 0.1	2.42 x 1.64 x 0.1
Gross surface area	m <sup>2</sup>	2.62	3.92
Aperture area	m <sup>2</sup>	2.33	3.49
Collector contents	l	1.9	2.7
Weight	kg	41.4	61.2
Max. working overpressure	bar	10	10
Max. stagnation temperature. <sup>1)</sup>	°C	272	272
Connection diameter, compression fitting	mm	15	15
Sensor sleeve	mm	6	6
Collector material		Al / Cu / glass / silicone / PBT / EPDM / TPE	
Glass tube material		borosilicate glass 3.3	
Selective absorber coating material		aluminum nitride	
Glass tube (Ø ext./Ø int./wall thckn./tube lgth.)	mm	47/37/1.6/1500	
Colour (aluminium frame profile, anodised)		aluminum grey	
Colour (plastic parts)		black	
Thermal shock test / ITW test number		06COL513/1	
Hailstone test according to DIN EN 12975-2 / TÜV test number		435/142448	
EC type examination		Z-IS-DDK-MUC-07-08-100029919-003	
DIN CERTCO registration number		011-751950 R	

<sup>1)</sup> at 1000 W/m<sup>2</sup> and 30 °C.

### International certifications & standards:



## CPC OEM XL Evacuated tube collectors with CPC-reflector

### Specification

Series		CPC OEM XL 1914	CPC OEM XL 1918	CPC OEM XL 1921
Number of evacuated tubes		14	18	21
$\eta_0$ in relation to aperture, EN 12975	%	64.2	64.2	64.2
$a_1$ with wind, in relation to aperture	W/(m²k)	0.89	0.89	0.89
$a_2$ with wind, in relation to aperture	W/(m²k²)	0.001	0.001	0.001
Yield forecast (location Würzburg, Germany, reference area 3 m²)	kWh/m²a	651	651	651
Yield forecast (location Würzburg, Germany, reference area 5 m²)	kWh/m²a	589	589	589
Grid dimensions (length x height x depth)	m	1.62 x 2.05 x 0.1	2.08 x 2.05 x 0.1	2.42 x 2.05 x 0.1
Gross surface area	m²	3.34	4.28	5
Aperture area	m²	2.97	3.84	4.46
Collector contents	l	2.22	2.85	3.33
Weight	kg	47.4	61	71.2
Max. working overpressure	bar	10	10	10
Max. stagnation temperature. <sup>1)</sup>	°C	272	272	272
Connection diameter, compression fitting	mm	15	15	15
Sensor sleeve	mm	6	6	6
Collector material	Al / Cu / glass / silicone / PBT / EPDM / TPE			
Glass tube material	borosilicate glass 3.3			
Selective absorber coating material	aluminum nitride			
Glass tube (Ø ext./Ø int./wall thickn./tube lgth.)	mm	47/37/1.6/1920		
Colour (aluminium frame profile, anodised)	aluminum grey			
Colour (plastic parts)	black			
Thermal shock test / ITW test number	06COL513/1			
Hailstone test according to DIN EN 12975-2 / TÜV test number	435/142448			
EC type examination	Z-IS-DDK-MUC-07-08-100029919-003			
DIN CERTCO registration number	011-751950 R			

<sup>1)</sup> at 1000 W/m<sup>2</sup> and 30 °C.

### International certifications & standards:

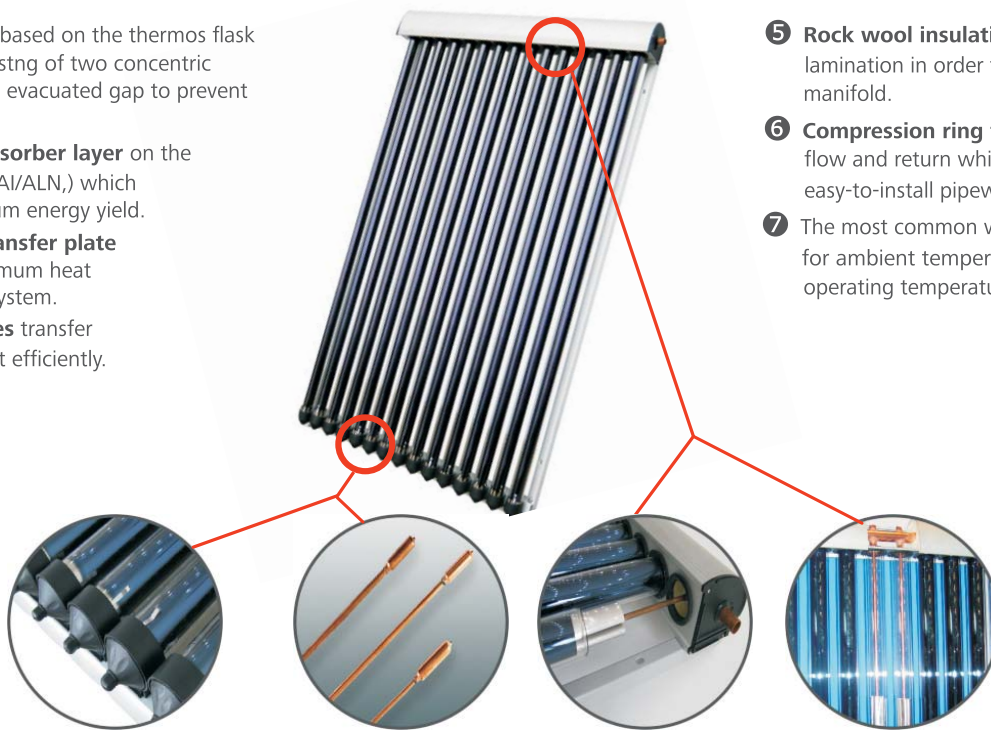




## Evacuated heat pipe technology

### Evacuated heat pipe collector technology

- ❶ **Evacuated tubes** based on the thermos flask principle and consisting of two concentric glass tubes and an evacuated gap to prevent heat loss.
- ❷ Highly selective **absorber layer** on the inner glass tubes (Al/ALN,) which enables an optimum energy yield.
- ❸ Aluminum heat **transfer plate** to provide an optimum heat transfer medium system.
- ❹ **Copper heat pipes** transfer the extracting heat efficiently.



- ❺ **Rock wool insulation** with an aluminum lamination in order to prevent heat loss in the manifold.
- ❻ **Compression ring fitting** (Ø 22 mm) for flow and return which enable a safe and easy-to-install pipework connections.
- ❼ The most common working fluid is water for ambient temperatures of - 30 °C to an operating temperature to 90 °C.

### Heat pipes made in China

The evacuated heat pipe technology uses the maximum fraction of solar irradiation at minimum ambient temperatures of -30 °C and maximum operating temperatures to 90 °C.

#### Key benefits:

- High collector efficiency of medium temperature systems suitable for pressurized and non-pressurized solar thermal applications.
- Due to the rapid heat conductivity evacuated heat pipe collectors are suitable for solar thermal applications in cooler areas with low ambient temperatures.\*
- Well-known indestructibility of the evacuated heat pipe collectors according to DIN EN 12975-2.

#### Recommended application areas:

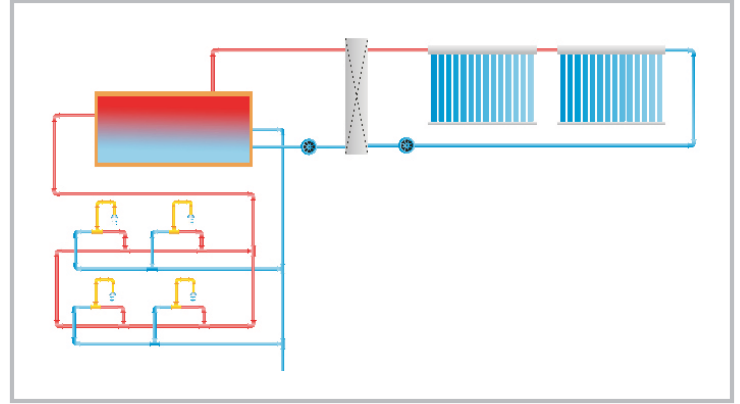
Hot water generation and heating support.

\*in dependence on the respective heat transfer medium.

## Evacuated heat pipe collectors

for water, space and process heating.

\* Recommend for residential, public and commercial applications with 70 ~ 90°C temperature requirement.



### Scope of delivery

Fully pre-assembled unit comprising

- 12-30 evacuated heat pipes,
- manifold with direct flow heat conduction unit and dry tube connection.

Collectors are packed in individual boxes. In addition, there is a sun protection sheet over the evacuated heat pipe collector.

### Installation types

- Pitched roof, flat roof, on-wall.

### Advantages and benefits

- Short installation times due to complete pre-assembled collectors.
- Manageable module sizes for a very high performance and a quick and easy installation.
- Highly efficient thermal insulation.
- Flow and return pipes may be filled on the left or the right side of the manifold.
- High flexibility due to the different widths and lengths of the collectors.
- Pressurized and non-pressurized operation.
- Season independent operation depending on the heat transfer medium.

### Performance characteristics

- Rapid thermal conductivity.
- High energy yield and low heat loss due to the high vacuum of the evacuated tubes.
- Operating at minimum ambient temperatures of -30 °C to maximum operating temperatures of 90 °C.
- Two loop system to constantly maintain a good water quality and to ensure water on cold days due to the anti-freezing medium in the solar circulation loop and an easy integration of other energy supplies.

## Evacuated heat pipe technology

### Specification

Type		R58-1812	R58-1818	R58-1824	R58-1830
Number of evacuated tubes		12	18	24	30
$\eta_0$ in relation to aperture, EN 12975	%	72.1	72.1	72.1	72.1
$a_1$ with wind, in relation to aperture	W/(m <sup>2</sup> k)	2.252	2.252	2.252	2.252
$a_2$ with wind, in relation to aperture	W/(m <sup>2</sup> k <sup>2</sup> )	0.0018	0.0018	0.0018	0.0018
Grid dimensions (length x height x depth)	m	1.91 x 0.97 x 0.11	1.91 x 1.42 x 0.11	1.91 x 1.87 x 0.11	1.91 x 2.32 x 0.11
Gross surface area	m <sup>2</sup>	1.85	2.71	3.57	4.43
Aperture area	m <sup>2</sup>	1.22	1.82	2.43	3.04
Collector contents	l	0.638	0.961	1.285	1.608
Weight (Net weight)	kg	36	54	72	90
Max. working pressure	bar	8			
Max. stagnation temperature	°C	245			
Connection diameter, compression fitting	mm	22			
Glass tube material	mm	borosilicate glass 3.3			
Evacuated tube	mm	Ø 58 x 1800			
Selective absorber coating material		AL-N-Cu			
Gap between the tubes	mm	75			

<sup>1)</sup> at 1000 W/m<sup>2</sup> and 30 °C.

Other product models (12-30 evacuated heat pipes, 58mm glass tube ) are available on request.

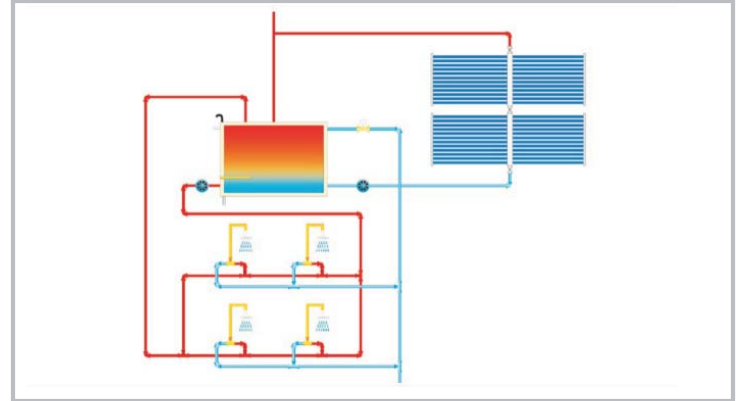
### International certifications & standards:



## LPC Evacuated tube collectors

for water heating.

\* Recommend for residential and public applications with 60 ~ 80°C temperature requirement.



### Scope of delivery

- Evacuated tubes based on the thermos flask principle,
- manifold.

### Installation types

- Pitched roof, flat roof.

### Advantages and benefits

- Long operating life time but low in maintenance costs and repair requirements.
- Quick and easy installation.
- Short amortization rate.
- Customized product solutions.

### Performance characteristics

- High energy yield and low heat loss due to the high vacuum of the evacuated tubes and PU insulation HFC245-FA.
- High-quality stainless steel in the inner tank to continuously maintain a good water quality.

### Specification

Type		LPC 47-1550	LPC 58-1830	LPC 58-1850
Inner tank	material/mm	SUS304 / 0.5(0.6)	SUS304 / 0.5(0.6)	SUS304 / 0.5(0.6)
Outer tank*, side and bottom frames	material	Aluminum alloy		
Inlet & outlet dimension	mm	25	25	25
Grid dimensions (length x height x depth)	m	3.07 x 1.92 x 0.16	2.56 x 1.94 x 0.16	3.67 x 2.16 x 0.16
Gross surface area	m <sup>2</sup>	5.6	4.8	7.6
Aperture area	m <sup>2</sup>	3.3	3	5
Evacuated tube	mm	Ø 47 x 1500	Ø 58 x 1800	Ø 58 x 1800
Gap between the tubes	mm	70	80	80
Weight (Operating weight)	kg	162	175	264
Evacuated tubes	no.	50/Horizontal	30/Vertical	50/Horizontal
Max. working pressure	bar	0.5	0.5	0.5
Max. stagnation temperature	°C	99	99	99

\* Stainless steel outer tank on request.

Other product models (25-50 evacuated tubes, 47-1500mm / 58-1600mm / 58-1800mm / 58-2100mm) are available on request.



## 2 Thermosiphon system

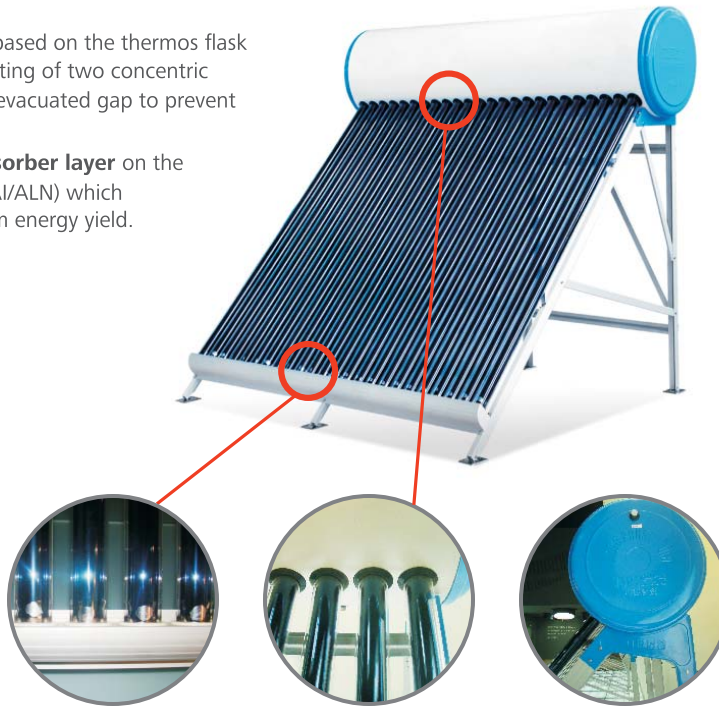
Non-Pressurized thermosiphon systems with evacuated tubes .....	16
Pressurized thermosiphon systems with evacuated heat pipes .....	18
Split pressurized thermosiphon systems with evacuated heat pipes .....	19
Pressurized jacket-type thermosiphon systems with evacuated tubes .....	20
Accessories of thermosiphon system.....	21



# Thermosiphon technology

## Thermosiphon technology with evacuated tube collectors by Linuo Paradigma

- ❶ **Evacuated tubes** based on the thermos flask principle and consisting of two concentric glass tubes and an evacuated gap to prevent heat loss.
- ❷ Highly selective **absorber layer** on the inner glass tubes (Al/ALN) which enables an optimum energy yield.

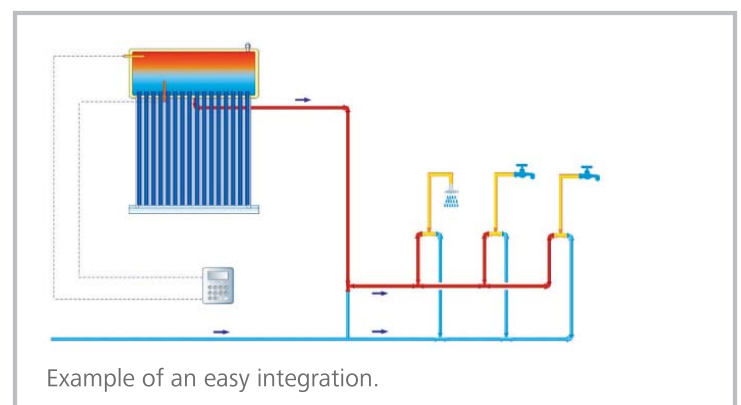
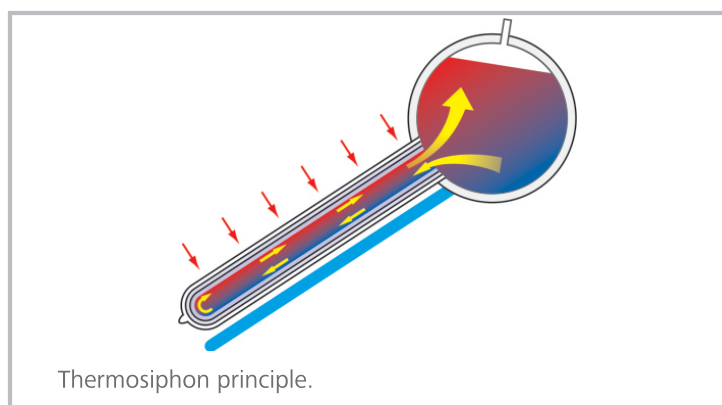


- ❸ Inner tank made of high quality **stainless steel SUS 304-2B** to continuously maintain a good water quality.
- ❹ Outer tank with a **corrosion protection** coating.
- ❺ Environmental-friendly **PU-foam insulation** for an optimal heat conservation.
- ❻ Strong and durable **aluminum brackets**.

### Thermosiphon principle

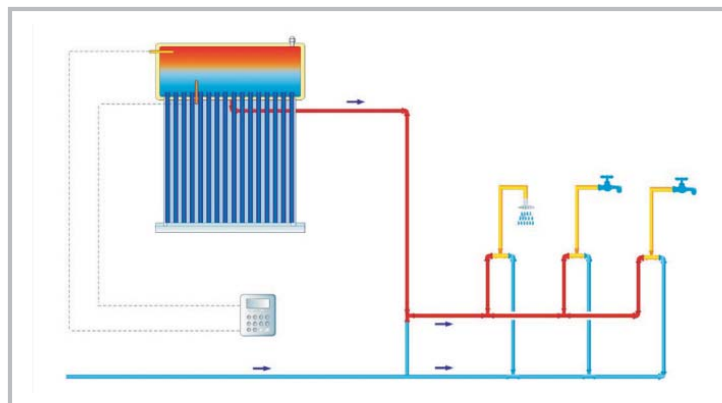
Thermosiphons use the sun to heat the working fluid (mostly water) in the evacuated tube collector. The solar collector absorbs solar radiation, converts the sunlight into heat and transfers it to the water. The heated water naturally rises through the solar collectors into the tank where the cooler water at the base of the tank is forced out and descends to the bottom of the collector (thermosiphon circulation). The circulation will be interrupted when there is no solar radiation. The heated water is then held in the storage tank, where the insulation conserves the heat.

Whereas active solar water heating system rely on electric pumps, valves, and controllers to circulate the water through the evacuated tube collector, a thermosiphon system relies on gravity and the tendency for water to naturally circulate as it is heated. Since complex mechanical liquid pumps are not necessary, thermosiphon systems are a reliable and cost-effective solution for generating hot water. Thermosiphon systems are mainly used in regions with a high solar radiation and a good water quality.



## Non-pressurized thermosiphon systems with evacuated tubes

for water heating available with 100-300L tank.



### Scope of delivery

- Tank, aluminum brackets, evacuated tubes.

### Installation types

- Pitched roof, flat roof.

### Advantages and benefits

- Cost-effective solar water heating solution.
- Long operating life time but low in maintenance costs and repair requirements.
- Short amortization rate.
- Customized solar water heating solutions.

### Performance characteristics

- High energy yield and low heat loss due to the high vacuum of the evacuated tubes and PU insulation HFC245-FA.\*
- High-quality stainless steel in the inner tank to continuously maintain a good water quality.

### Specification

Series		LP-100L	LP-200L	LP-300L
Series number		LP-58-1810	LP-58-1820	LP-58-1830
Tank capacity	L	100	200	300
Material inner tank	material / mm	Stainless steel 304 / 0.5	Stainless steel 304 / 0.5	Stainless steel 304/ 0.5
Insulation of tank	material / mm	Polyurethane / 45	Polyurethane / 45	Polyurethane / 45
Material outer tank	material / mm	Painted steel / $\phi$ 472	Painted steel / $\phi$ 472	Painted steel / $\phi$ 472
Bracket	material / thickness	Aluminum alloy / 1.5-3mm		
Bracket inclination	degree	30/42	30/42	30/42
Type of evacuated tubes	mm	$\phi$ 58×1800	$\phi$ 58×1800	$\phi$ 58×1800
Evacuated tubes	no.	10	20	30

\* Other tank capacity and evacuated tube quantity are available on request.

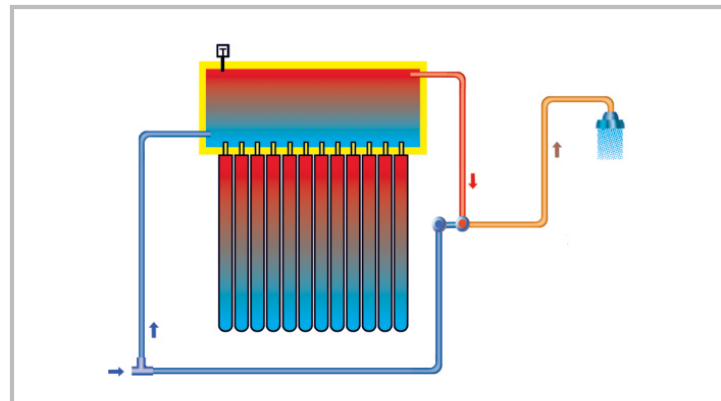
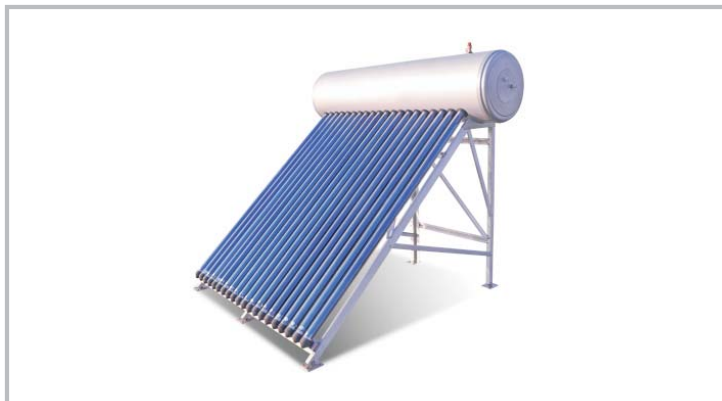
\* harmless to ozone layer

### International certifications & standards:



## Pressurized thermosiphon systems with evacuated heat pipes

for water heating available with 100-300L tank.



### Scope of delivery

- Tank, aluminum brackets, evacuated heat pipes.

### Installation types

- Flat roof, pitched roof.

### Advantages and benefits

- Easy installation and Low maintenance cost of heat pipe and evacuated tubes.
- High-quality stainless steel / carbon steel enamel for the inner tank to continuously maintain a good water quality.
- Stable operating without tube scaling or pipe explosion risk.

### Performance characteristics

- Fast system starting, high energy yield and low heat loss.
- Strong capability of antifreeze that is available for applications in low temperature area.
- Pressurized system operating which is suitable for different installation methods.

### Specification

Series		HP 100L	HP 150L	HP 200L	HP 300 L
Series number		HP 100L-SS	HP 150L-SS	HP 200L-SS	HP 300L-SS
Tank capacity	L	100	150	200	300
Material inner tank	material / mm	Stainless Steel SUS304-2B / 1.2 / Diameter 385			
Material outer tank	material / mm	White painted steel or stainless steel / 0.4 / Diameter 480			
Side cover	material	Blue painted steel or stainless steel			
Insulation	material / mm	Polyurethane / 47.5			
Bracket	material	Aluminum alloy / 1.5mm			
Bracket inclination	degree	30			
Type of evacuated tubes	mm	φ 58 × 1800 mm evacuated tube & heat Pipe			
Evacuated heat pipes	no.	10	15	20	30
Max. operating pressure	Mpa	0.6			
Other parts		Provision for electric heating and anode protection			

### International certifications & standards:

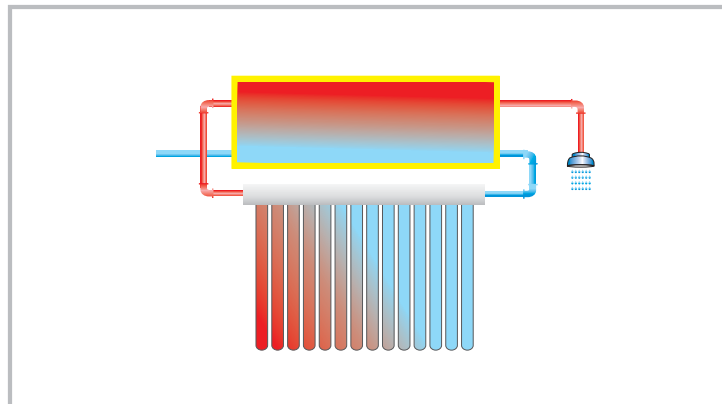
\* Other tank capacity, number of heat pipes, insulation thickness and bracket type are customizable.





## Split pressurized systems with evacuated tube heat pipes

for water heating available with 80L, 150L, 200L and 300L.



### Scope of delivery

- Tank, galvanized sheet brackets, heat pipe collector.

### Installation types

- Flat roof, pitched roof.

### Advantages and benefits

- Easy installation, low maintenance cost and elegant appearance.
- The special designed system bracket can be applied for both flat roof and pitched roof.
- Building-integrated solar water heating application with a flexible tank system.

### Performance characteristics

- Fast system starting, high energy yield and low heat loss.
- High-quality stainless steel in the inner tank to continuously maintain a good water quality.
- Inner tank is suitable for high pressure conditions.

### Specification

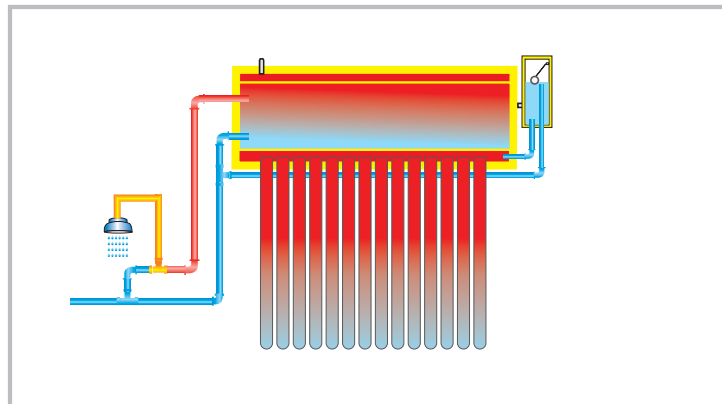
Series		PS-150L	PS-200L	PS-300L
Series number		PS 150L-SS	PS 200L-SS	PS 300L-SS
Tank capacity	L	150	200	300
Material inner tank	material / mm	Stainless steel 304-2B / 1.2 / Diameter 385		
Insulation of tank	material / mm	Polyurethane / 47.5		
Material outer tank	material / mm	Sliver gray painted steel / 0.4 / Diameter 480		
Bracket	material	Galvanized sheet / 1.5mm		
Bracket inclination	degree	30		
Type of collector		HP collector R1818	HP collector R1824	HP collector R1836
Type of evacuated tubes	mm	φ58×1800 mm evacuated tube & heat Pipe		
Evacuated heat pipes	no.	18	24	36
Aperture area	m <sup>2</sup>	1.821	2.429	3.036
Gross area	m <sup>2</sup>	2.708	3.567	4.427
Max. operating pressure	Mpa	0.6	0.6	0.6

### International certifications & standards:



## Pressurized jacket-type thermosiphon systems with evacuated tubes

for water heating available from 150L to 250L.



### Scope of delivery

- Tank with floating tank, aluminum brackets, evacuated tubes.

### Installation types

- Flat roof.

### Advantages and benefits

- Available for applications with low requirements of water quality.
- Automatic feeding of heat-conducting water by floating ball control.
- Customized solar water heating solutions.

### Performance characteristics

- Separate circulation of heating water and daily-used hot water to ensure the purity of daily-used hot water.
- Adopts mechanical temperature control to set high-temperature cut-off and operating temperature.
- Inner tank is suitable for high pressure conditions.

### Specification

Series		JT-150L	JT-200L	JT-250L
Series number		JT 150L-SS	JT 200L-SS	JT 250L-SS
Tank capacity	L	150	200	250
Material inner tank	material / mm	Stainless steel SUS 304 / 1.2		
Material outer tank	material / mm	Painted steel / 0.4		
Floating tank	capacity	5L		
Material floating tank		Stainless steel SUS 304		
Bracket	material	Aluminum alloy 6063		
Bracket inclination	degree	30		
Type of evacuated tubes*	mm	φ 47 × 1800 mm		
Evacuated tubes	no.	18	24	30
Rated operating pressure	Mpa	0.6		
Electric heating	Power	1500W		
Other parts		Temperature controller and anode protection		

\*φ 58 × 1800 mm evacuated tube up on request.

## Accessories of thermosiphon system

For thermosiphon systems, we also provide full set accessories with high quality.



### Electric heater (Side-type /Bottom-type)

- Installation site:  
Side-type: side cover of tank, connected by thread screw  
Bottom-type: bottom of tank, connected by Flange
- Power: 1500W / 2500W
- Voltage: 220V
- Frequency: 50Hz
- Temperature controller: 160°C high-temperature cut off



### Auto water valve

- Operating medium: water
- Operating temperature:  $\leq 60^{\circ}\text{C}$
- Operating pressure: 0.02- 1.0MPa
- Rate of water supply:  $\geq 2\text{L} / \text{min}$  (under 0.02MPa)  
 $\geq 20\text{L} / \text{min}$  (under 0.30MPa)  
 $\geq 30\text{L} / \text{min}$  (under 0.80MPa)



### System controller

Main functions:

- Water level and temperature display,
- auto cold water supply (for non-pressurized system),
- electric heater control,
- constant temperature control,
- high-temperature cut off,
- overload protect and leakage protect,
- power off memory.

Supporting accessories:

- Scaling resistant floating ball sensors,
- magnetic valve,
- parts for installation.

\* Both side-type and bottom-type floating ball sensors are available



### Top-type assistant tank

- Capacity: 5~10L
- Material inner tank: SUS304
- Material outer tank: painted steel
- Material floating ball: SUS304
- Insulation: Polyurethane
- Inlet / outlet / air vent: G1/2" or G3/4"
- Stop supply: 30% of storage tank capacity

### Side-type assistant tank

- Capacity: 4L
- Material inner tank: SUS304
- Material outer tank: SUS304 (available with color coating)
- Water supply valve: engineering- plastics
- Rate of water supply: 12L / min (under 0.30MPa)

\* Other assistant tank capacity could be customized.

## Reference projects



- 1 Location of project: New Zealand  
 Application area: Residential sector  
 Application: Water heating  
 Project size: 160m<sup>2</sup>



- 2 Location of project: South Korea  
 Application area: Public sector  
 Application: Water heating  
 Project size: 1,920m<sup>2</sup>



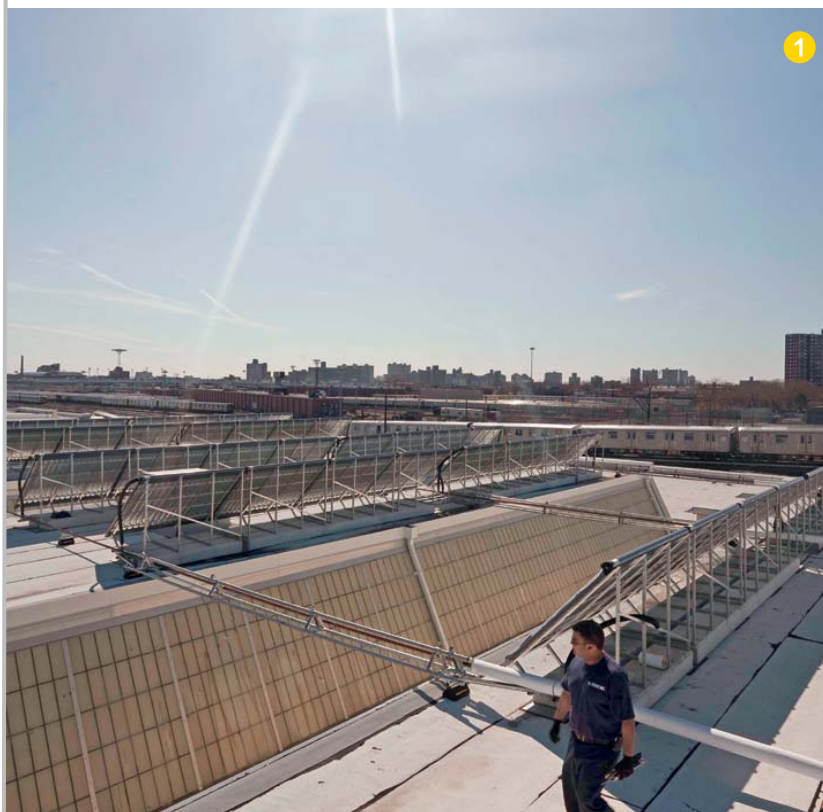
- 3 Location of project: Mexico  
 Application area: Service sector  
 Application: Water and pool heating  
 Project size: 90m<sup>2</sup>



- 4 Location of project: South Korea  
 Application area: Public sector  
 Application: Water heating  
 Project size: 96m<sup>2</sup>



## Reference projects



- 1 Location of project: USA  
Application area: Industrial sector  
Application: Water heating  
Project size: 164m<sup>2</sup>



- 2 Location of project: Ethiopia  
Application area: Industrial sector  
Application: Water heating  
Project size: 60m<sup>2</sup>



- 3 Location of project: Japan  
Application area: Industrial sector  
Application: Solar cooling  
Project size: 204m<sup>2</sup>



- 4 Location of project: Taiwan  
Application area: Public sector  
Application: Water heating  
Project size: 144m<sup>2</sup>



## Reference projects



- ① Location of project: IBM Tech Park in India  
 Application area: Commercial sector  
 Application: Solar cooling  
 Project size: 3,200m<sup>2</sup>



- ② Location of project: South Korea  
 Application area: Service sector  
 Application: Water and pool heating  
 Project size: 2,360m<sup>2</sup>



- ③ Location of project: Mexico  
 Application area: Service sector  
 Application: Water and pool heating  
 Project size: 600m<sup>2</sup>



## Reference projects



- 1 Location of project: Indonesia  
Application area: Residential sector  
Application: Water heating  
Project size: 1080m<sup>2</sup>



- 2 Location of project: China  
Application area: Residential sector  
Application: Water heating  
Project size: 17,984m<sup>2</sup>



- 3 Location of project: South Africa  
Application area: Residential sector  
Application: Water heating  
Project size: 130m<sup>2</sup>

## Reference projects

- 1 Location of project: Taiwan  
Application area: Residential sector  
Application: Water heating  
Project size: 188m<sup>2</sup>
- 2 Location of project: Cuba  
Application area: Residential sector  
Application: Water heating  
Project size: 90m<sup>2</sup>
- 3 Location of project: Indonesia  
Application area: Residential sector  
Application: Water heating  
Project size: 36m<sup>2</sup>
- 4 Location of project: Mexico  
Application area: Residential sector  
Application: Water heating  
Project size: 60m<sup>2</sup>

